

WHAT IS CLAIMED IS:

- 1 1. A radial styrenic block copolymer having a general formula:
2 $(AB)_nX$
3 wherein:
4 (i) A is a styrenic block,
5 (ii) B is a dienic block,
6 (iii) X is a residue of a diester coupling agent,
7 (iv) n is the number styrenic block copolymer arms bonded to the residue of a diester
8 coupling agent,
9 (v) the molecular weight of the styrenic block copolymer arm (AB) is from about 2000
10 daltons to about 300,000 daltons, and
11 (vi) the weight percentage of the polymer wherein n is at least 5 is less than about 8
12 percent.
- 1 2. The radial styrenic block copolymer of Claim 1 wherein the weight percentage
2 of the polymer wherein n is at least 5 is less than about 6 percent.
- 1 3. The radial styrenic block copolymer of Claim 2 wherein the weight percentage
2 of the polymer wherein n is at least 5 is less than about 5 percent.
- 1 4. The radial styrenic block copolymer of Claim 1 wherein the weight percentage
2 of the polymer wherein n=2 is less than about 5 percent.
- 1 5. The radial styrenic block copolymer of Claim 4 wherein the weight percentage of
2 the polymer wherein n=2 and n is at least 5 is less than about 12 percent.
- 1 6. The radial styrenic block copolymer of Claim 1 wherein the styrenic block (A) is
2 polystyrene.

1 7. The radial styrenic block copolymer of Claim 1 wherein the dienic block (B) is
2 selected from the group consisting of polybutadiene, polyisoprene and mixtures thereof.

1 8. The radial styrenic block copolymer of Claim 1 wherein the molecular weight of
2 the styrenic block copolymer arm (AB) is from about 3,000 daltons to about 150,000
3 daltons.

1 9. The radial styrenic block copolymer of Claim 8 wherein the molecular weight of
2 the styrenic block copolymer arm (AB) is from about 30,000 daltons to about 100,000
3 daltons.

1 10. The radial styrenic block copolymer of Claim 1 wherein the residue of a diester
2 coupling agent is a residue of a diester selected from the group consisting of dimethyl
3 adipate, diethyl adipate, dimethyl terephthalate, diethyl terephthalate, and mixtures
4 thereof.

1 11. A method for preparing a radial styrenic block copolymer of Claim 1 comprising:
2 (a) contacting styrenic and dienic monomers with an anionic polymerization initiator
3 which is an organo-substituted alkali metal compound in a suitable solvent to form a
4 living polymer cement;
5 (b) adding from about 0.01 to about 1.5 equivalents of a metal alkyl compound per
6 equivalent of living polymer chain ends to the cement, during or after polymerization,
7 wherein the alkyl groups of the metal alkyl compound are chosen so that they will not
8 exchange with the living polymer chain ends and the metal alkyl compound is selected
9 from the group consisting of aluminum, zinc and magnesium alkyls having from 1 to 20
10 carbon atoms per alkyl substituent; and
11 (c) adding a diester coupling agent to the cement under reaction conditions sufficient
12 to couple the living polymer.

- 1 12. The method of Claim 11 wherein 0.9:1 to 1.1:1 equivalents of a metal alkyl
2 compound per equivalent of living polymer chain ends is added to the cement.
- 1 13. The method of Claim 11 wherein the metal alkyl compound is a trialkyl
2 aluminum compound.
- 1 14. The method of Claim 13 wherein the trialkyl aluminum compound is triethyl
2 aluminum.
- 1 15. The method of Claim 11 wherein the molar ratio of diester to living polymer
2 chains is from about 0.2:1 to about 0.3:1.
- 1 16. The method of Claim 11 wherein the molar ratio of diester to living polymer
2 chains is about 0.25:1.
- 1 17. The method of Claim 11 wherein the metal alkyl compound is added in step
2 (b) at or after 70 weight percent conversion of the monomers.
- 1 18. The method of Claim 17 wherein the metal alkyl compound is added in step
2 (b) at or after 90 weight percent conversion of the monomers.
- 1 19. A modified bitumen comprising an admixture of a radial styrenic block
2 copolymer of Claim 1 and bitumen.
- 1 20. A hydrogenated radial styrenic block copolymer prepared by hydrogenating a
2 radial styrenic block copolymer of Claim 1.
- 1 21. The hydrogenated radial styrenic block copolymer of Claim 20, wherein the
2 radial styrenic block copolymer of Claim 1 is hydrogenated using a selective
3 hydrogenation process.